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CABL-YZER P 9030A

PRELIMINARY MANUAL

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PRELIMINARY INSTRUCTION MANUAL

CABL-YZER

P 9030

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SECTION I

PRELIMINARY INFORMATION

1.1 DESCRIPTION

The Cabl-yzer P9030 is a plug-in head for the 9000 series Kay Scopes. It is used in conjunction with an RF Sweep Generator to measure and display gain, loss, and return loss. It contains two precision attenuators, an electronic RF switcher, a return-loss bridge, and a 15 db RF amplifier and detector.

1.2 SPECIFICATIONS

FREQUENCY RANGE	20-500 MHz
IMPEDANCE	75 ohms
GAIN/LOSS VSWR	1.2:1 overall
INTER CHANNEL CROSSTALK	50 db down
SWITCHING RATE	0.2-1000 Hz
MAXIMUM RF INPUT	3.0 VRMS
ATTENUATORS	62.75 db maximum in 0.25 db steps
RETURN LOSS BRIDGE	Transformer type

1.3 OPERATION

1.3.1 GAIN MEASUREMENTS

Gain measurements are made by comparing the output signal level of the amplifier under test against that of a known standard or reference level. The standard path includes the Loss attenuator which should have 0 db inserted. The comparison is made by alternately switching the inputs and outputs of the two signal paths, using a common signal source and a common output amplifier and detector and displaying the two paths on the scope CRT (See Figure 2). The two paths are made to have equal output amplitudes, by inserting attenuation into the test signal (Gain) path, and computing the amplifier gain by summing the inserted attenuation. If it takes a total of 30 db inserted in the Gain attenuator to produce equal outputs, then the amplifier under test has 30 db gain.

Care must be taken to insure that the internal P9030 RF amplifier is not overloaded. Maximum input into the FROM DEVICE UNDER TEST connector or the RF INPUT connector with 0 db inserted in the Loss attenuator should be 100mv or less. Use the Sweep Generator attenuator or insert equal attenuation steps into the Gain and Loss attenuators to obtain this signal level. If the P9030 attenuators are used, you must subtract the inserted attenuation from the Gain measurement calculation to obtain the correct gain in decibels.

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1.3.2 LOSS MEASUREMENTS

Loss measurements are made in a fashion similar to the Gain measurements. The device to be measured is connected to the DEVICE UNDER TEST terminals. The Gain attenuator, with 0 db inserted, comprises the standard or reference path. The loss of the test device is computed by inserting attenuation with the Loss attenuator until the two paths have equal output amplitudes. The loss is the total of the attenuation inserted. That is, if it requires a total of 15 db inserted in the Loss attenuator to produce equal signal outputs, then the loss of the device under test is 15 db. Again, care must be exercised so that the RF input signal is below 100mv to prevent internal amplifier overload. This may best be accomplished by inserting suitable attenuation with the Sweep Generator attenuators. If no generator attenuator is available, equal steps may be inserted in both the Gain and Loss attenuators and the amount of attenuation subtracted from the total is used to determine the Loss measurement.

1.3.3 RETURN LOSS MEASUREMENT

Return Loss measurements are made by feeding an RF Sweep signal through the Gain attenuator and out of the TO DEVICE UNDER TEST connector to the Bridge RF INPUT connector. Set the FUNCTION switch to RETURN LOSS. Insert 20 db in the Loss attenuator to eliminate RF switch feed thru

when working at small SWR ratios. The Bridge is removable from the P9030 front panel so that it can be brought to the unit to be tested. This insures a short cable length between the Bridge and the device to be tested (See Figure 3). Connect the Bridge output terminal to the FROM UNIT UNDER TEST connector. All cabling, between the P9030, the Bridge, and the device under test should be 75 ohm impedance and be as short as possible, particularly that which connects the test device to the Bridge.

The Bridge output voltage is proportional to the mismatch of the device under test. This voltage is fed into a 15 db RF amplifier, making it possible to detect return-loss measurements up to 36 db. When making measurements of small mismatches, the maximum RF amplitude available from the Sweep Generator should be used and the Kay Scope VERTICAL A AMPLITUDE control should be set for maximum gain.

NOTE

When making measurements of larger mismatches, it may be necessary to reduce the Generator output level by 6 db to prevent amplifier overload.

To determine the Return Loss of the device under test, note the amplitude displayed on the scope. Remove the device under test from the bridge TEST connector and insert sufficient attenuation with the Gain attenuator to bring the scope display to the same amplitude as noted above. Sum up the inserted attenuation and refer to the VSWR Nomograph to determine

the Return Loss of the device. For example, if 14 db is required to equalize the signal amplitudes, then look down the Return Loss db column to 14 db, read across to the VSWR column, and read 1.5 VSWR.

In some cases, it may be desirable to measure Return Loss without having to remove the device under test from the bridge. This may be accomplished by inserting 0 db in the Gain attenuator and using the Loss attenuator for calibration. Insert 16 db attenuation in the Loss attenuator to compensate for the bridge losses. Switch the FUNCTION switch to AUTO to display, alternately, the Return Loss and the calibrating signals. Connect the device under test to the Bridge TEST connector. Insert additional attenuation in the Loss attenuator to equalize the amplitudes of the two signals. Total up the inserted attenuation values and subtract 16 db to obtain the device Return Loss in decibels.

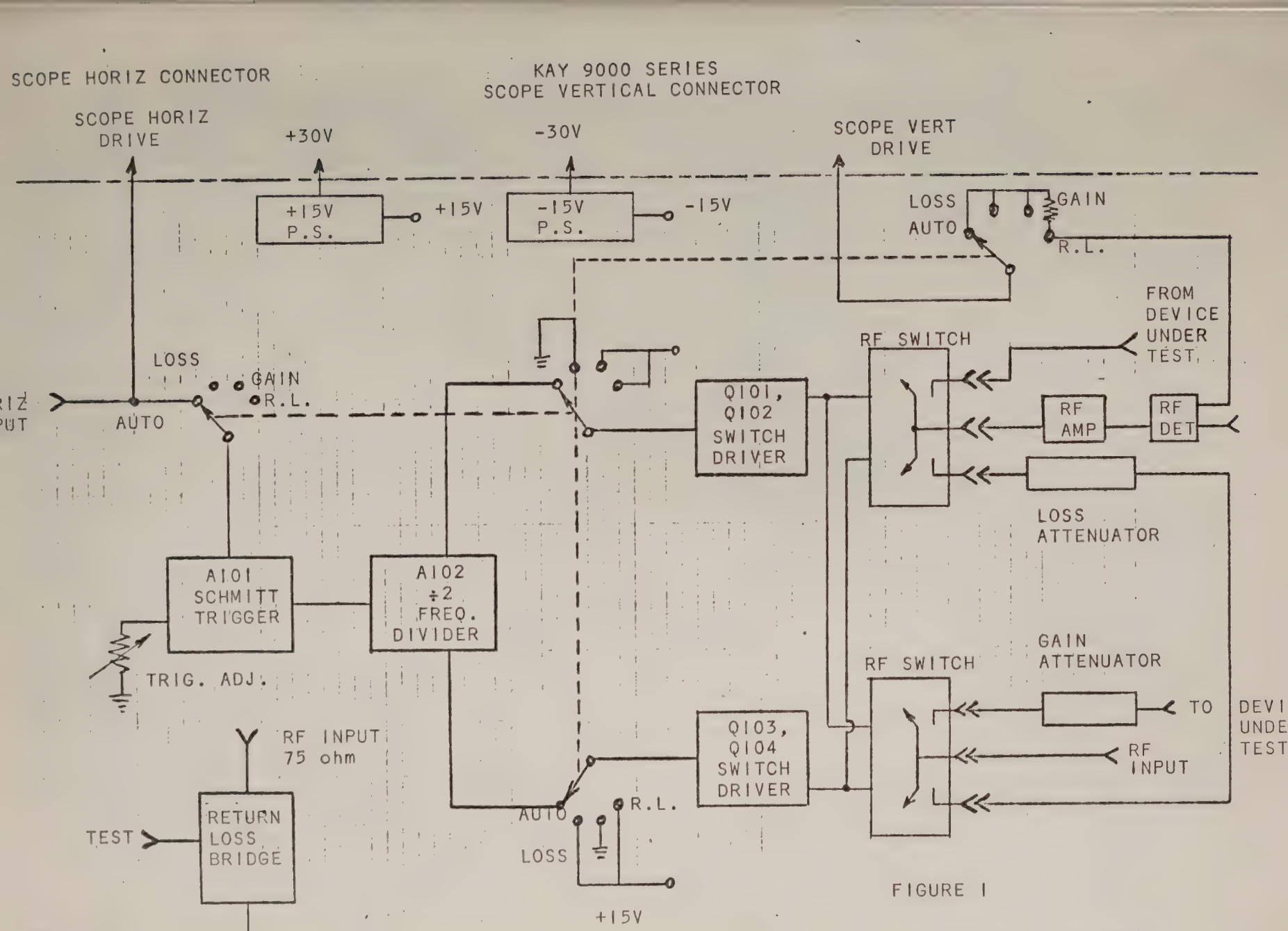


FIGURE 1

P 9030A CABL-YZER BLOCK DIAGRAM

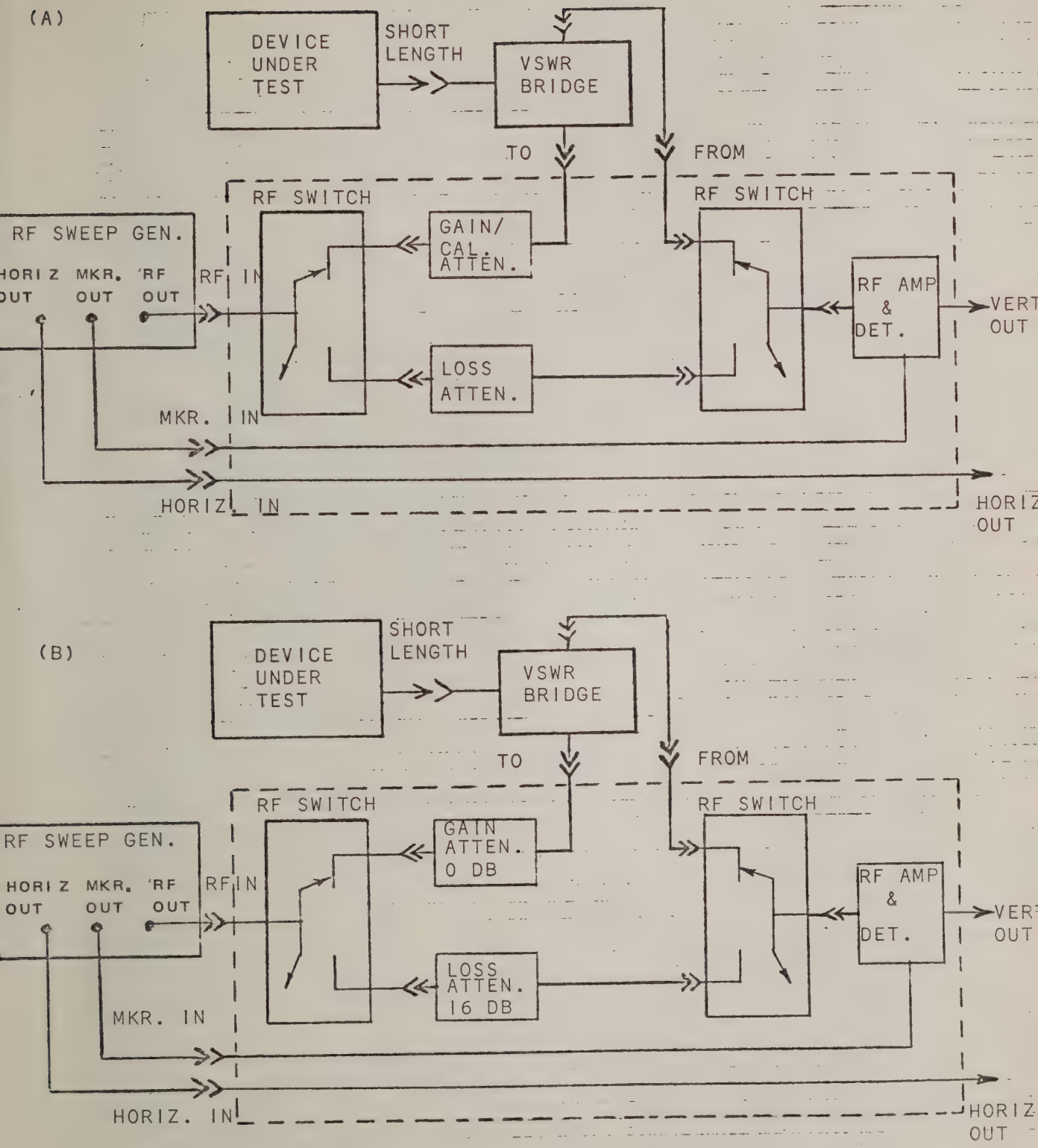


FIGURE 3 RETURN - LOSS MEASUREMENT BLOCK AND INTERCONNECTION DIAGRAM

A - DIRECT CALIBRATION METHOD
B - ALTERNATE METHOD ALLOWING SIMULTANEOUS DISPLAY OF MEASUREMENT AND CALIBRATION

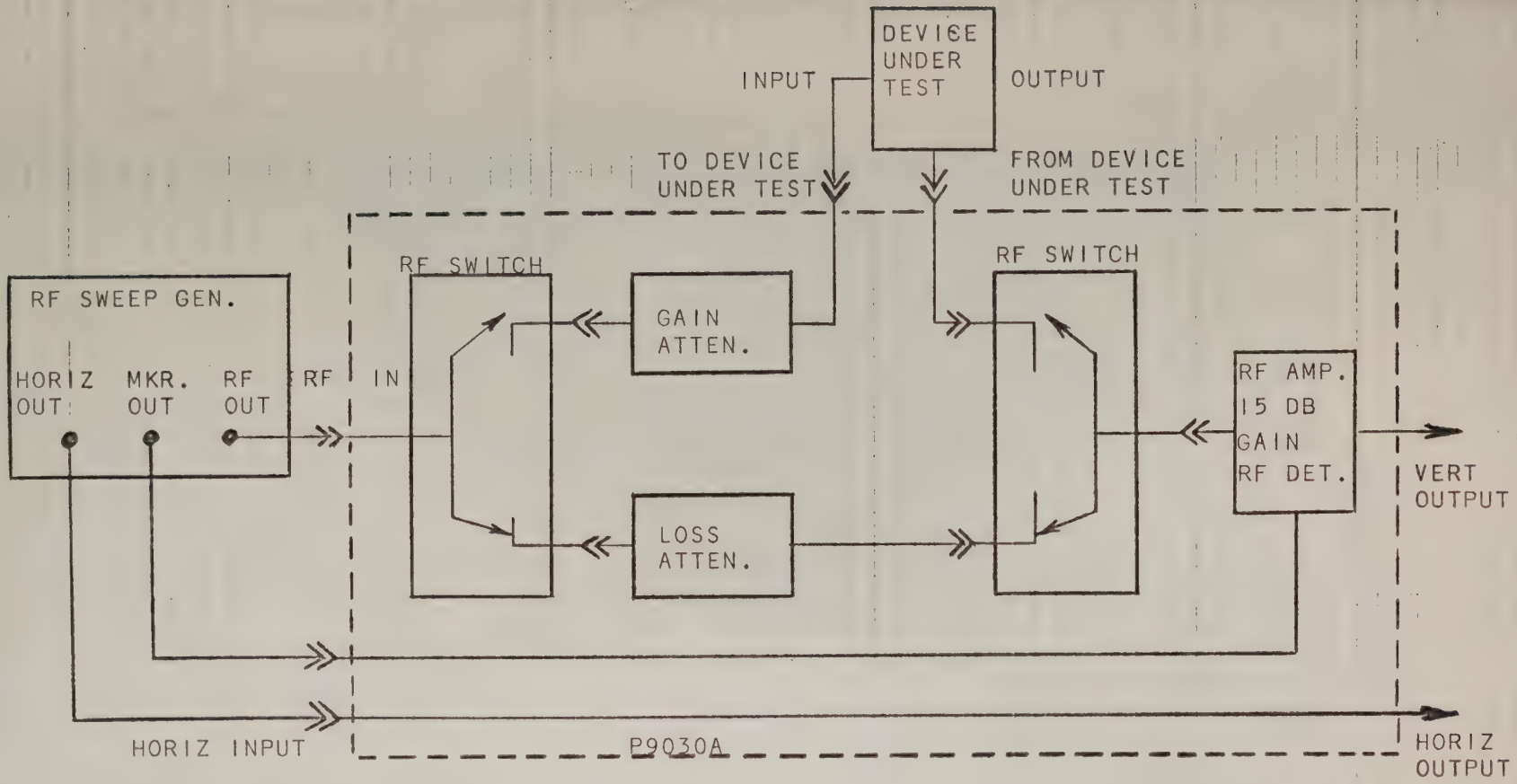
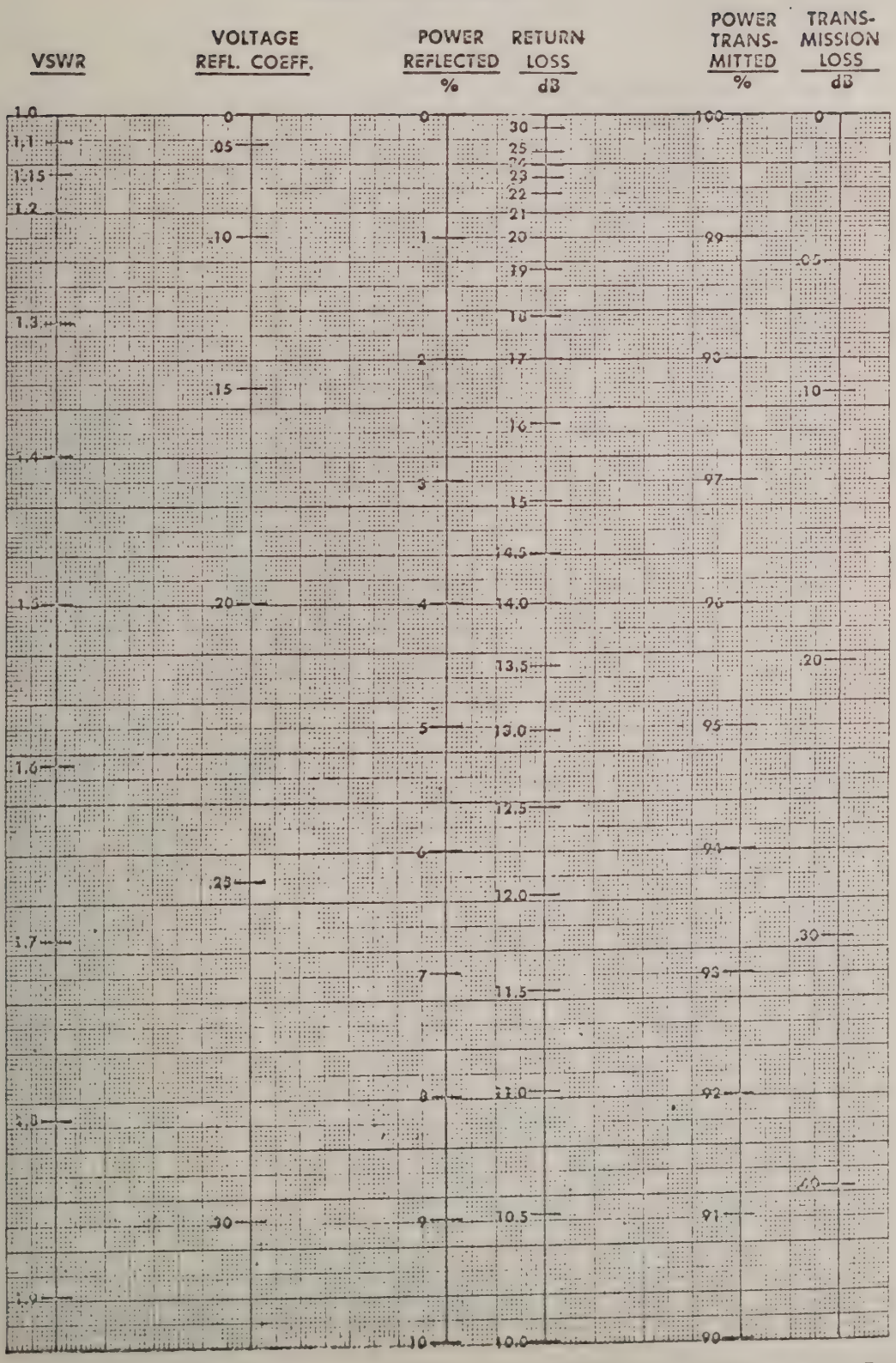


FIGURE 2 GAIN-LOSS MEASUREMENTS. BLOCK AND INTERCONNECTION DIAGRAM.

FOR GAIN MEASUREMENTS--REFERENCE OUTPUT IS OBTAINED BY REMOVING ALL ATTENUATION FROM THE LOSS ATTENUATOR. READ GAIN BY USING GAIN ATTENUATOR TO PRODUCE EQUAL OUTPUTS.

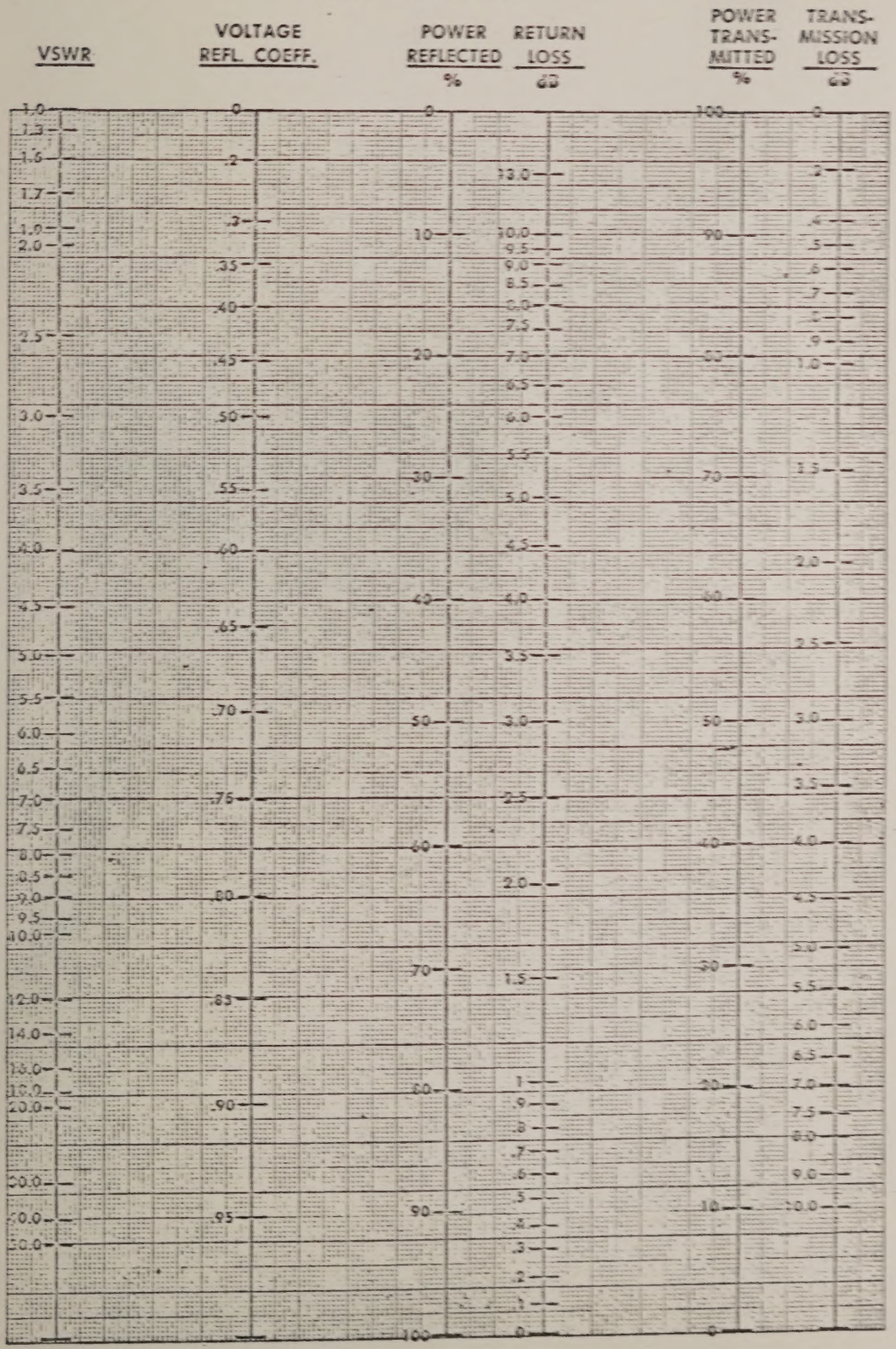
FOR LOSS MEASUREMENTS--REFERENCE OUTPUT IS OBTAINED BY REMOVING ALL ATTENUATION FROM THE GAIN ATTENUATOR. READ LOSS ATTENUATOR TO PRODUCE EQUAL OUTPUTS.

VSWR NOMOGRAPH



Courtesy of Microwave Journal

VSWR NOMOGRAPH



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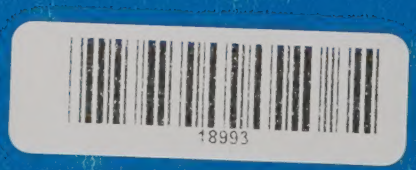
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